

CLAIMS

What is claimed is:

- 5 1. A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the component comprising a nonaqueous organic monomeric compound.
- 524/81 2. The compositing^{SP} of Claim 1, wherein the compound includes at least one of an alcohol, an ester, an ether, a silane, a vinyl monomer, an acrylic monomer, or a methacrylate monomer.
- 10 3. The composition of Claim 1, comprising a solvent and a solute, and wherein the compound is the solvent.
4. The composition of Claim 3, wherein the solvent includes an alcohol.
5. The composition of Claim 4, wherein the alcohol is methyl alcohol, ethyl alcohol, isopropanol, or t-butanol.
6. The composition of Claim 3, wherein the solvent includes an ester.
- 15 7. The composition of Claim 6, wherein the ester includes at least one of ethyl acetate, dimethyl succinate, diethyl succinate, dimethyl adipate, or ethylene glycol diacetate.
8. The composition of Claim 2, wherein the compound includes a mixed vinyl-silane monomer.

9. The composition of Claim 8, wherein the mixed monomer includes vinyltriisopropoxysilane.
10. The composition of Claim 2, wherein the acrylic monomer includes at least one of tri(propylene glycol) diacrylate, ethylene glycol phenyl ether acrylate, or 1,6
5 hexanediol diacrylate.
11. The composition of Claim 2, wherein the methacrylic monomer includes at least one of 1,3 butylene glycol dimethacrylate, neopentyl glycol dimethacrylate, butyl methacrylate, 1,6 hexanediol dimethacrylate, or di(propylene glycol) allyl ether methacrylate.
- 10 12. The composition of Claim 1, wherein the compound is curable in combination with a photoinitiator to form a solid, by ultraviolet radiation having a wavelength between about 320-500 nm and an energy density of about 1 joule/cm².
13. The composition of Claim 1, wherein the compound is a solvent for a resin in
15 the particulate material.
14. The composition of Claim 13, wherein the resin includes at least one of shellac, polyvinyl pyrrolidone, polyvinyl acetate, polyvinyl alcohol, polystyrene, styrene-butadiene copolymer, or acrylonitrile-butadiene-styrene copolymer.
15. The composition of Claim 1, wherein the particulate material includes a filler
20 that includes an inorganic compound.
16. The composition of Claim 15, wherein the filler includes at least one of clay, aluminum oxide, silicon dioxide, aluminum silicate, potassium aluminum

silicate, calcium silicate, calcium hydroxide, calcium aluminate, calcium carbonate, sodium silicate, zinc oxide, titanium dioxide, or magnetite.

17. The composition of Claim 15, further comprising a printing aid dispersed throughout the filler.

- 5 18. The composition of Claim 17, wherein the printing aid includes at least one of sorbitan trioleate, sorbitan mono-oleate, sorbitan monolaurate, polyoxyethylene sorbitan mono-oleate, polyethylene glycol, soybean oil, mineral oil, propylene glycol, fluoroalkyl polyoxyethylene polymers, glycerol triacetate, polypropylene glycol, ethylene glycol octanoate, ethylene glycol decanoate, ethoxylated
10 derivatives of 2,4,7,9-Tetramethyl-5-decyne-4,7-diol, oleyl alcohol, or oleic acid.

- 15 19. A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder composition including an adhesive in combination with a fluid, the adhesive comprising a nonaqueous organic monomeric compound.

- 20 20. A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the composition comprising an anionically ionizable polymer consisting of compounds selected from the group including polymethacrylic acid, polymethacrylic acid sodium salt, and sodium polystyrene sulfonate.

21. A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the composition including an adhesive in combination with a fluid, the adhesive comprising an anionically ionizable polymer consisting of compounds selected from the group including

polymethacrylic acid, polymethacrylic acid sodium salt, and sodium polystyrene sulfonate.

- 5 22. A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the composition comprising a cationic polymer.
23. The composition of Claim 22, wherein the polymer includes polyethyleneimine and polydiallyldimethylammonium chloride.
- 10 24. A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder composition including an adhesive in combination with a fluid, the adhesive comprising a cationic polymer.
- 15 25. A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the composition comprising a nonionic polymer.
26. The composition of Claim 25, wherein the polymer includes at least one of polyvinyl pyrrolidone, polyvinyl pyrrolidone copolymer with polyvinyl acetate, polyvinyl alcohol, polyvinyl methyl ether, polyacrylamide, or poly-2-ethyl-2-oxazoline.
- 20 27. A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder including an adhesive in combination with a fluid, the adhesive comprising a nonionic polymer.
28. A chemical composition for selectively adhering particulate material to form a

solid object in a three-dimensional printer, the adhesive comprising a polymer selected from the group consisting of polymethacrylic acid, polymethacrylic acid sodium salt, sodium polystyrene sulfonate, and polyethyleneimine.

5 29.

A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder including an adhesive in combination with a fluid, the adhesive comprising a polymer selected from the group consisting of polymethacrylic acid, polymethacrylic acid sodium salt, sodium polystyrene sulfonate, and polyethyleneimine.

10 30.

A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the adhesive comprising a waterborne colloid selected from the group consisting of polymethyl methacrylate, polystyrene, natural rubber, polyurethane, polyvinyl acetate, and alkyd resins.

15 31.

A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder including an adhesive in combination with a fluid, the adhesive comprising a polymer selected from the group consisting of polymethyl methacrylate, polystyrene, natural rubber, polyurethane, polyvinyl acetate, and alkyd resins.

20 32.

A chemical composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the adhesive comprising an inorganic solute selected from the group consisting of sodium polyphosphate, sodium hydrogen phosphate, sodium hydrogen pyrophosphate, sodium tetraborate, ammonium hydrogen phosphate, sodium chloride, ammonium nitrate, potassium sulfate, ammonium chloride, and calcium formate.

33. A binder composition for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder including an adhesive in combination with a fluid, the adhesive comprising an inorganic solute selected from the group consisting of sodium polyphosphate, sodium tetraborate, sodium chloride, ammonium nitrate, potassium sulfate, ammonium chloride, and calcium formate.

5

34. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition including a nonaqueous organic monomeric compound.

10

35. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising an anionically ionizable polymer consisting of compounds selected from the group including polymethacrylic acid, polymethacrylic acid sodium salt, and sodium polystyrene sulfonate.

15

36. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising a cationic polymer.

20

37. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and

25

applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising a nonionic polymer.

- 5 38. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising a polymer selected from the group consisting of polymethacrylic acid, polymethacrylic acid sodium salt, sodium polystyrene sulfonate, and polyethyleneimine.
- 10
39. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising a waterborne colloid selected from the group consisting of polymethyl methacrylate, polystyrene, natural rubber, polyurethane, polyvinyl acetate, and alkyd resins.
- 15
40. A method of forming a three-dimensional object, comprising:
forming a layer of filler that includes a particulate material; and
applying a chemical composition to the layer of filler at particular locations to bind the filler at particular locations, the composition comprising an inorganic solute selected from the group consisting of sodium polyphosphate, sodium tetraborate, sodium chloride, ammonium nitrate, potassium sulfate, ammonium chloride, and calcium formate.
- 20